Monograph: Drug Quantitation in Biological Specimens for DUI cases

Providing expert testimony of driving impairment is possible without quantitative drug levels. According to the Drug Recognition Expert (DRE) training program of the National Highway Traffic Safety Administration, an interpretation of impairment must include: (a) the observations of poor driving, (b) poor field sobriety test performance, and (c) the presence of a drug or metabolite consistent with the subject's symptomology. When observations of an officer or a DRE correlate with the findings of the toxicologist, a good case for driving impairment can be made. However, an opinion of driving impairment based solely on a quantitative level of a drug or drugs is scientifically unfounded and possibly unethical.

Quantitative analysis to determine performance decrement such as driving impairment has little scientific validity. The reasons are based on many factors which include:

1) **Drug quantitation in urine is of limited value**. Quantitation of drugs in urine is not performed in the Laboratory. The amount of drug found in urine provides little correlation to the level that may be circulating in the blood at the time of sampling. Drug presence in urine samples serves only to establish exposure to a drug.

2) **Therapeutic levels of drugs do not predict impairment.** Therapeutic concentrations for most drugs found in driving cases vary widely in the scientific literature. While therapeutic ranges have been established for some prescription medications (e.g., certain benzodiazepines, pain killers and muscle relaxants), these ranges indicate levels of effectiveness and are not indicative of impairment. An opinion of impairment cannot be made based on a quantitative drug level, regardless of whether that level is above, below, or within the therapeutic range. Additionally, these therapeutic ranges are for a single drug or metabolite. In the majority of samples, combinations of drugs further complicate quantitative interpretation. There are few driving studies involving impairment associated with single drug, drug-drug, or drug-alcohol combinations.

3) **Tolerance is an important factor**. Interpretation of quantitative levels is of no forensic significance unless the pattern of drug use of the individual is known; this is rarely the case. A blood concentration of a drug in a chronic user that produces few symptoms of intoxication may, in a naive user, be a fatal level. This principle is especially important in illicit drug users where tolerance to a drug can build dramatically.

4) **Extrapolation is difficult with a single sample.** Quantitation provides information on the level of a drug at a single time point but cannot, by itself, be used to determine when the drug was used. Generally, drug effects and blood levels follow similar (although often offset) time curves; blood levels and effects start out low, then peak, and then gradually diminish. Without knowing where in the time curve the sample was taken, it is impossible to extrapolate time of peak effects. For a quantitation to be truly

meaningful, two or three samples taken over a known period of time would be needed, although even then interpretation would be difficult.

5) **In vitro decomposition may impact the quantitation of drugs**. Many drugs, especially cocaine and THC (the psychoactive compound in marijuana), undergo a continual decline in concentration while in a sample tube; even preservatives introduced in the tube will not completely prevent decomposition. This phenomenon can introduce significant differences between drug concentration at the time of sampling compared to the time of analysis. There is currently no method to back-extrapolate the quantitative results to determine drug concentration at the time of sampling.

These roadblocks to meaningful interpretation of quantitative toxicological results have long been established in scientific journal articles:

> "Testing of drugs or drug metabolites in urine is only of qualitative value in indicating some prior exposure to specified drugs. Inferences regarding the presence or systemic concentration of the drug at the time of driving or impairment from drug use are generally unwarranted." (Consensus Report *Drug Concentrations and Driving Impairment.* Journal of The American Medical Association Nov. 8, 1985- vol.54. no. 18.)
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> "Interpreting the effects of substances found in urine on performance is in most cases scientifically unsupportable." (Arthur J. McBay. *Substance Abuse Testing.* Pathologist. 1986 vol.40. p35-37.)
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> "In contrast to the correlation of peak blood alcohol concentration and peak impairment, the relationship between drug level and performance frequently is unknown or unpredictable. Further, interpretations are complicated by the effects of pharmacologically active metabolites, by the potential for performance enhancement by certain drugs at certain doses, and by issues of individual sensitivity and tolerance." (Marcelline Burns. *Sobriety Tests for the Presence of Drugs.*Alcohol, Drugs and Driving. 1987 vol.3, no.1.)
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> "Sufficient information is not available on most drugs for an expert to offer a scientifically defensible opinion that driving impairment or improvement is correlated with their concentrations." Arthur J. McBay. *Drug Concentrations and Traffic Safety.* Alcohol, Drugs and Driving. 1986 vol.2, no.3-4.)

We hope these explanations clarify our position regarding routine quantitation of driving-related toxicology specimens. Should an investigation arise where quantitation may be important, feel free to discuss the case with the Director of the Forensic Toxicology Laboratory.